DELAY FACTORS IN GREEN BUILDING DEVELOPMENT PROJECTS IN MALAYSIA: A PHENOMENOLOGICAL STUDY

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DECLARATION

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I hereby declare that this Master's Project is the result of my own work, except for quotations and summaries that have been duly acknowledged.

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NOVEMBER 2013

ABSTRACT

The purpose of this phenomenological qualitative study was to identify the primary causes of delays in green building construction project in Malaysia that employ the GBI rating system as perceived by the green building consultants that were involved in the project. There are three objectives to this study they are:

- To identify the major differences in green building construction process compared to traditional buildings.
- To identify if these differences introduces delays that are not present in traditional building construction
- To propose possible methods to overcome the delays introduced by the difference in construction process if such delays are present.

The participants of the study are the personnel of Green Energy Design Studio Sdn Bhd. There are three consultants managing various projects with working experience ranging from one to five years. A semi-structured interview was conducted with each of the participant individually as part of the data collection process. The interview was then transcribed and phenomenological analysis was conducted to identify the significant statements that provides insight to addressing the research objectives.

From the interviews, the participants clarified the green building constructions process and it was found that this process is similar to those of traditional buildings. However, there are new elements introduced to meet the additional requirements for green building certification. These new elements occur in paralles to the existing process and do not present a major stumbling block to the project scheduel.

The analysis of the data then provided three themes for delay factors. They are commercial, knowledge and people. Each of these theme have various factors associated with it and each of the factors is explained and discussed in detail. For the mitigating factors, three themes also emerged from the data. They are commercial, knowledge and communications. Again the various factors associated with each theme is discussed in detail.

Keywords:

Green building construction, Malaysia, Schedule, Delay, Project Management.

FAKTOR-FAKTOR KELEWATAN DALAM PROJEK PEMBANGUNAN BANGUNAN HIJAU DI MALAYSIA

ALFONSO BIN JOHAN

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ABSTRAK

Tujuan kajian kualitatif ini adalah untuk mengenal pasti punca utama kelewatan dalam projek pembinaan bangunan hijau di Malaysia yang menggunakan sistem penarafan GBI sebagaimana yang diamati oleh perunding bangunan hijau yang terlibat dalam projek tersebut. Terdapat tiga objektif kajian ini, iaitu:

• Untuk mengenal pasti perbezaan dalam proses pembinaan bangunan hijau berbanding dengan bangunan tradisional.

• Untuk mengenal pasti jika perbezaan ini menyebabkan kelewatan

• Untuk mencadangkan kaedah mengatasi masalah kelewatan yang disebabkan oleh perbezaan dalam proses pembinaan jika ada.

Para peserta kajian adalah kakitangan Green Energy Design Studio Sdn Bhd Terdapat tiga perunding menguruskan pelbagai projek dengan pengalaman bekerja antara satu hingga lima tahun. Satu temuduga separa berstruktur telah dijalankan dengan setiap peserta secara individu sebagai sebahagian daripada proses pengumpulan data. Temuduga kemudian disalin dan analisis fenomenologi telah dijalankan untuk mengenal pasti kenyataan signifikan yang dapat memberikan jawapan kepada objektif penyelidikan ini.

Daripada proses temu bual, peserta menjelaskan proses pembinaan bangunan hijau dan didapati bahawa proses ini adalah sama dengan bangunan-bangunan tradisional . Walau bagaimanapun, terdapat unsur-unsur baru yang diperkenalkan untuk memenuhi keperluan tambahan bagi pensijilan bangunan hijau. Unsur-unsur baru tersebut dijalankan secara serentak dengan proses yang sedia ada dan tidak mejadi penghalang kepada kemajuan projek.

Analisis data yang kemudian mengenalpasti tiga tema untuk faktor-faktor kelewatan. Mereka adalah perdagangan, pengetahuan dan faktor manusia. Setiap satu daripada tema ini mempunyai pelbagai faktor yang berkaitan dengannya dan setiap faktor-faktor dibincangkan secara terperinci. Bagi faktor-faktor mengurangkan kelewatan, tiga tema juga dikenalpasti daripada dat iaitu terma komersil, ilmu dan komunikasi. Faktor-faktor yang dikaitkan dengan setiap tema tersebut juga dibincangkan secara terperinci.

Kata Kunci:

Pembangunan Bangunan Hijau, Malaysia, Jadual, Kelewatan, Pengurusan Projek.

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LIST OF ABBREVIATIONS

BREEAM..... Building Research Establishment Environmental Assessment Method

CASBEE .....Comprehensive Assessment System for Build Environment Efficiency

CVA .....Completion and Verification Assessment

GBI.....Green Building Index

IEB .....Industrial Existing Building

INC..... Industrial New Construction

LEED ..... Leadership in Energy and Environmental Design

NREB..... Non Residential Existing Building

NRNC .....Non Residential New Construction

RNC ..... Residential New Construction

SEDA .....Sustainable Energy Development Authority

Chapter 1. Introduction

1.1 Background

The construction industry in Malaysia is one of the major drivers of economy with a gross output value of over RM94 billion in 2010 and employing over 900,000 personnel (Department of Statistics Malaysia, 2012). The industry is worth about 12% of Malaysia's Gross Domestic Product (Department of Statistics Malaysia, 2012). It can be said that the industry has reached an equilibrium where the management of construction projects and related matters are concerned. Practices in the industry are adopted throughout the spectrum of those involved.

It is therefore easy to understand the inertia of the industry in adopting new practices. The advent of environmental concerns in general and sustainable development specifically has introduced new elements into the industry. With the recent erratic weather conditions and the rise in sea levels due to the problems associated with rise of ambient temperatures particularly in cities and human transformed environments, many advocates have put the push for a more responsible and environmentally friendly way to develop and construct buildings forward.

Sustainable development is an idea that was introduced in the United Nations report entitled Our Common Future. The definition of sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations World Commission on Environment and Development, 1987).

One of the new elements brought about by sustainable development is the creation of green buildings. A green building is a building that focuses on increasing the

efficiency of resource use – energy, water, and materials – while reducing building impact on human health and the environment during the building's lifecycle, through better sitting, design, construction, operation, maintenance, and removal (Greenbuildingindex Sdn Bhd, 2012).

There are various types of green buildings such as high efficiency buildings and sustainable buildings, the general idea of a green buildings are buildings that support the concept of sustainable development in that it considers the entire value chain of the building, from the source of supplies, construction practices, maintenance of the building as well as deconstructing the building at the end of its life. Green building concepts also extend outside of the building structure itself. This includes to the type of land that the building is being developed on, whether it's an existing land or the land has to be transformed so that it is suited for development. Sourcing materials for the building construction is also part of the sustainable development. The argument is that when materials are sourced from places far away and requires transport such as shipping or flight to send it to the project site, and then the building is contributing to environmental degradation due to the fossil fuels and pollution generated by the entire delivery chain used to transport the goods.

There are various certification bodies that can determine if a building meets the criteria of a green building or not. In Malaysia the standard used is known as the Green Building Index (GBI). Other standards are Leadership in Energy and Environmental Design (LEED) that is primarily used in the USA, Building Research Establishment Environmental Assessment Method (BREEAM) from the UK as well as Singapore's Green Mark rating standard. The various standards are present because they cater for the differences in the operating environment such as climate, availability of materials and processes. However, all the standards are relatively young and there are new

elements are always being introduced and the current standards are being improved (Vierra, 2011).

1.2 Problem Statement

Project management introduces the concept of the triple constraint, where each project management professional needs to deliver a project on time, within budget and adhering to the scope defined. Therefore, for any project albeit construction, software, event management or any other elements that adhere to the definition of a project; they are required to meet the triple constraint to be considered as successfully managed.

Construction projects has been a good type of project to do research due to the complexities in dealing with various different types of elements within the project as well as the diverse group of people involved in the project from general and skilled labourers to the consultants that design the buildings and its internal systems. As such, construction projects also adhere to the triple constraint of project management to be considered successfully managed.

Construction projects suffer from various problems and delay of time is one of the primary problems. Delays are such a serious problem in that many delays end up with the contractor and owners at opposites end of the legal system in dispute resolution.

Sustainable development has now taken an important role in the current world as natural resources are a scarce item and available housing land is reducing with the boom of human population. Development of sustainable or green buildings is no exception to the problems of delays. Malaysia has now committed to sustainable development by creation of government agencies such as the Sustainable Energy Development Authority (SEDA) and the formation of the Greenbuildingindex Sdn Bhd by a group of private enterprises that implements the Green Building Index (GBI) rating system.

Alaghbari et al. (2007) have studied the causes of delays in the Malaysian construction industry, however the study concentrated on the construction projects by identifying different perception of the parties involved. The study does not differentiate between traditional projects and green projects.

Doyle et al. (2009) has studies factors that have potential impacts to green buildings based on the LEED rating system. They concluded that for the case of LEED certified buildings, the elements introduced from the requirements of certification does not add substantially to the schedule of the project, and some elements of the work actually shortens project duration such as sourcing for materials locally.

The study by Doyle et al. (2009) provides a basis for this project, however this project aims to study the impact of green building requirements for the Malaysian construction industry with an emphasis on the GBI rating system.

1.3 Objectives of the Study

This project attempts to identify if there are factors specific to green building construction that can have an adverse impact on the project schedule.

The following objectives have been identified for this study:

- To identify the major differences in green building construction process compared to traditional buildings.
- To identify if these differences introduces delays that are not present in traditional building construction
- To propose possible methods to overcome the delays introduced by the difference in construction process if such delays are present.

1.4 Research Proposition

The research proposition is that green building requirements in Malaysia can introduce substantial delays in the project schedule.

1.5 Significance of the Study

There have been a large number of studies done to understand factors contributing delays in construction projects. However, most of these previous studies concentrates on traditional building construction and do not consider the additional elements introduced in green building construction such as the green building consultant, differences in construction process, the need to source for sustainable materials and other elements advocated by the green building rating system.

The study aims to see if the introduction of these new elements in the green building construction value chain introduces elements that can cause delay which are not typically present in construction of non-green certified buildings.

1.6 Scope of the Study

For the study to be successfully carried out, a clearly defined boundary needs to be stated. As with project management, the study also needs to be completed within time and budget as well as meeting the required standards of a well researched study in order to add to the betterment of the field.

Since the study attempts to identify the factors contributing to delays in green building projects, it is important to identify the green building rating system that the study will concentrate on as well as the type of buildings considered. These two elements form the primary boundary of the study and play a crucial role in the data collection process design.

1.6.1 Green Building Rating Systems

Due to the availability of various Green building rating systems, this study will only use the Malaysian rating system known as the Green Building Index (GBI) as its reference as the project is done in the context of green buildings in Malaysia. Usages of other green building rating systems are for reference or comparison only.

Some of the prominent green building rating systems and the countries that use it are depicted in the table below. There is no attempt to discuss the difference between the different green building systems due to the constraints of the study. Suffice to say each green rating system has its own merits and for this study, only GBI buildings will be considered.

Table 1.1 List of countries and the green rating systems

Country	Green Building Rating System
Australia	Green star
Canada	Green Globes
China	Ministry of Construction's Green Building Evaluation Standard (Three Star System)
Germany	German Sustainable Building Council (DGNB)
Japan	Comprehensive Assessment System for Build Environment Efficiency (CASBEE)
Singapore	Green Mark
United Kingdom	Building Research Establishment Environmental Assessment Method (BREEAM)
United States of America	Leadership in Energy and Environmental Design (LEED)

The GBI rating itself defines various type of buildings when evaluations are considered, they are:

- Non residential new construction (NRNC)
- Residential new construction (RNC)
- Non residential existing buildings (NREB)
- Non residential new construction: Data centre

1.6.2 Types of Buildings Considered

This report will concentrate on the non-residential new construction (NRNC) projects, excluding the Data centre type. Residential new construction may be introduced if deemed appropriate to illustrate or clarify pertinent ideas. New construction project provides a good starting point for study as we can assess the green building elements introduced from the beginning of the project and ascertain its impact on the schedule and if any delays are caused by it.

Green certification of existing buildings are not considered as it may introduce additional complexities that may affect the project schedule, and could be difficult to ascertain if the delays are a result of the green building requirements or due to the problems associated with the building design, its current state or other factors. Within Malaysia itself, certification of existing buildings using GBI or any green building rating systems may be difficult to find as it is something that is relatively new and existing building owners may not want to undertake the rating system unless they are quite confident they can recoup the investments provided by being certified.

1.7 Definition of Terms

A *green building* is defined using the literature provided by Greenbuildingindex Sdn Bhd as a building that focuses on increasing the efficiency of resource use – energy, water, and materials – while reducing building impact on human health and the

environment during the building's lifecycle, through better sitting, design, construction, operation, maintenance, and removal.

For the purposes of clarity, this study shall use the term *traditional building* as a building that does not meet the requirements of a green building and does not attempt to seek green building certification.

A *green building rating system* is a recognized method for determining if a building meets the required criteria to be called a green building or not. There are various rating systems used, however in Malaysia the primary rating system is known as Green Building Index. For the purposes of this study unless otherwise specified, any mention of green building rating system will refer to the Green Building Index used in Malaysia.

As the study attempts to determine delay factors of green building construction in Malaysia, a definition of delay is required. Delay is defined as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for the delivery of a project (Ramanathan, Narayanan, & Idrus, 2012).

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